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Optical spectroscopy of random deformations in elastically-Anisotropic crystals containing rare-earth ions

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Abstract

© The Authors, published by EDP Sciences.We present the results of studies of spectral effects in the optical high-resolution (0.01 cm-1) spectra of rare-earth ions in crystals caused by random deformations of a crystal lattice. Low-Temperature polarized transmission spectra in a broad spectral range (5000-15000 cm-1) were taken for tetragonal single crystals ABO4 (A=Y, Lu; B=V, P) containing impurity Tm3+ ions with concentrations 0.2 and 1.0 at.%. A specific fine structure of singlet-doublet transitions in the Tm3+ ions was observed. We demonstrate a possibility to estimate a concentration of intrinsic lattice defects from the analysis of the measurement data, by making use of an analytical expression derived in the present work for the distribution function of random lattice strains induced by point defects in the elastically-Anisotropic continuum.

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